A COMPARATIVE STUDY BETWEEN OPEN AND LAPAROSCOPIC CHOLECYSTECTOMY IN GALLSTONE DISEASE

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CERTIFICATE

This is to certify that this dissertation entitled. **"A comparative study between open And Laparoscopic cholecystectomy In gallstone disease"** is a bonafide record of the work done by **Dr. S.Saravana Kumar** under my supervision and guidance in the department of General surgery of Tirunelveli Medical College. Tirunelveli during the period of his post graduate study from may 2007 to march 2010. For the partial fulfillment of M.S (General surgery) degree.

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INTRODUCTION

Gastro-intestinal surgery has undergone a revolution in the recent years by the introduction of laparoscopic techniques. The concept of "keyhole surgery" created an immediate disparity between the potential of the new technique and training of surgeons to perform it. Now modern surgical methods are aimed at giving cure along with minimal invasive techniques with patient in mind, safety never being compromised. Cholelithiasis, which continues to be one of the most common digestive disorders encountered, was traditionally being dealt by conventional or open cholecystectomy. With the introduction of laparoscopic cholecystectomy, the surgical community witnessed a revolution in basic ideology and the importance of minimal access surgery.

Laparoscopic cholecystectomy (LC) has become so safe and easy that it can be performed with much ease and safety because of better magnification. Although LC has shown clear benefits in terms of shortened hospital stay, less morbidity, mortality, a quicker return to work and with cosmetic advantage, many questions regarding this procedure remain unanswered, particularly relative to the gold standard procedure of open cholecystectomy.

Some surgeons have suggested that the rates of serious complications, particularly bile duct injury might be significantly higher in laparoscopic procedures resulting in major morbidity and even mortality.

Apart from the high costs of the equipment and the specialized training that is mandatory for mastery of the technique, the procedure inherently carries hazards and risks.

In a developing country like ours, where the medical costs and loss of working days constitute major issues, could laparoscopic cholecystectomy establish itself as a safe and cost effective alternative to the open method?

In our study, we have made an attempt to compare the advantages and drawbacks of both the procedures in an Indian set up.

AIMS AND OBJECTIVES

The aim of this study is to compare conventional cholecystectomy and laparoscopic cholecystectomy with respect to:

1. Duration of the procedure.
2. Post operative discomfort or pain.
3. Analgesic requirement.
4. Complications encountered.
5. Diet
6. Period of hospitalization.
7. Return to normal activity

REVIEW OF LITERATURE

Historical review:

Most of the progress in the diagnosis and treatment of biliary tract disease has been made in the last century, but gall stones and their sequelae which cause most of the maladies date back to 1085-945 BC having been discovered in the mummy of Priestess of Amen[1].

- The first systematic data about the disease was published as "De Medical Historic Mirabilis" by Marcellus Donatus[1] in 1596.
- Zambeccari[1] in 1636 performed cholecystectomy in a dog.
- The first cholecystectomy is credited to John Strong Bobbs[1] on June 15, 1867.
- Karl Langenbuch of Berlin performed first planned cholecystectomy on July 15, 1882 using the aseptic technique of Joseph Lister[2].

Laparoscopy took its origin in 1901 when George Kelling examined the abdominal cavity with an endoscope and named the procedure as celioscopy. He used air through a puncture needle to produce pneumoperitoneum.

- In 1929, Kalk introduced purpose designed instruments and was the firs to advocate dual trocar technique which opened the way for diagnostic and therapeutic laparoscopy.

- In 1933, Fervers reviewed his experience with 50 patients and recommended changing from room air to oxygen or carbon dioxide as an insufflating agent.
- In 1938, Janos Veress developed his spring loaded needle, the instrument of choice for creating pneumoperitoneum which remains almost unchanged to the present day.
- In 1960, Professor Kurt Semm in Germany developed an automatic insufflation device that monitored abdominal pressure and gas flow. He also developed a number of endoscopic instruments including thermo coagulation, angled lens, hook scissors, uterus vacuum mobiliser and endo-loop applicator. He developed an irrigation-aspiration apparatus with design modification to prevent tube clogging and also popularized many laparoscopic procedures.

He also facilitated laparoscopic training by creating the pelvi-trainer designed to demonstrate techniques required for operative laparoscopy.

- Hassan proposed a method called “open technique” which provided direct visualization of peritoneal cavity prior to trocar insertion. This “Hassan technique” has greatly reduced the complication rate associated with percutaneous or blind trocar entry into the peritoneum.

- The first ever laparoscopic cholecystectomy was performed by Philip Mourret[2] in Lyon in 1987 and Dubois performed it in Paris in 1988.
- In 1991, Tehemton Udwadia performed the first laparoscopic cholecystectomy in India.

Anderson et al[3] in a study to compare the effectiveness of LC over OC found that the hospital charge was $4070+ 297 for patients undergoing LC and $5017 + 497 for patients undergoing OC. This difference arose from the mean cost of in patient care which was $353 + 40 for LC patients and $1335+ 138 for OC patients. LC appeared to be both economically and physiologically better.

SURGICAL ANATOMY

Knowledge of relevant anatomy is important for the safe execution of any operative procedure. Specifically, in the context of a cholecystectomy, it has been recognized since long that misinterpretation of normal anatomy as well as the presence of anatomical variations contribute to the occurrence of major postoperative complications especially biliary injuries. Such injuries in turn can cause significant morbidity and occasionally even mortality. They are also one of the commonest causes of litigation against abdominal surgeons in the developed world. There is now a fair amount of data to suggest that the acceptance of laparoscopic cholecystectomy (LC) as the standard procedure, has led to an increase in bile duct injuries. This seems partly related to the different anatomical exposure of the area around the gallbladder especially the Calot's triangle during the laparoscopic procedure as opposed to the open procedure.

Hence, it is important for biliary and minimally invasive surgeons to appreciate basic anatomical facts as they apply to the performance of cholecystectomy as well as understand from literature how anatomical distortions or variations can contribute to complications. This review attempts to address these issues. It is not an exhaustive description of biliary anatomy but discusses anatomical facts that are of relevance to the performance of a safe cholecystectomy.

Gallbladder:

The gallbladder is a pear shaped organ situated in a fossa on the liver undersurface. It may be partially or completely embedded within the liver parenchyma, the so-called 'intrahepatic' gallbladder. This may create difficulties in dissection and may increase the chance of intraoperative injury to the liver. Although the main right pedicle is fairly deep in the liver parenchyma, large portal, and hepatic venous branches traverse the liver at a depth of around one cm from the gallbladder. Thus, a deep liver tear during the dissection of the gallbladder off its fossa can occasionally bleed profusely. Also, during the dissection it may be important to err on the side of the gallbladder rather than the liver parenchyma.

The gallbladder is divided into a fundus, a body and a neck or infundibulum. The 'Hartmann's pouch' an out pouching of the wall in the region of the neck is recognized more as an outcome of pathology in the form of dilatation or presence of stones. This pouch is variable in size but a large Hartmann's pouch may obscure the cystic duct and the Calot's triangle. This may be result of plain enlargement or due to adherence to the cystic duct or bile duct. Thus a small cystic duct can get completely hidden and traction on the gallbladder can lead to the bile duct looking like the cystic duct. An exaggerated form of the same process is the 'Mirizzi's syndrome' in which a large stone in the Hartmann's pouch area is either adherent to or erodes into the bile duct. This can create major difficulty during a cholecystectomy.

Cystic duct:

The cystic duct joins the gallbladder to the bile duct and is one of the important structures needing proper identification and division during a standard cholecystectomy. The cystic duct may run a straight or a fairly convoluted course. Its length is variable and usually ranges from 2 to 4 cm. Around 20% of cystic ducts are less than 2 cm. Hence there may be very little space to put clips or ligatures. True absence of the cystic duct is extremely rare and if the duct is not seen is more likely to be hidden. The cystic duct is usually 2-3 mm wide. It can dilate in the presence of pathology (stones or passed stones). The normal bile duct is also around 5 mm and hence can look like a mildly dilated cystic duct. In general a cystic duct larger than 5 mm (or the need to use a very large clip to completely occlude the duct) should arouse a suspicion of mistaken identity with the bile duct before it is clipped or ligated.

The cystic duct joins the gallbladder at the neck and this angle may be fairly acute. Also the mode of joining may be smooth tapering or abrupt. On the bile duct side its mode of union shows significant variations. Since such variations are not uncommon it may not be safe to try and dissect the cystic duct to its junction with the bile duct. It is important to remember that even in the low insertion variety the cystic duct rarely goes behind duodenum and therefore a ductal structure passing behind the duodenum is more likely to be the bile duct itself.

Double cystic ducts are described but are exceedingly rare and therefore two ductal structures entering the gallbladder should always be viewed with suspicion. Also the cystic duct does not have vessels traveling on its surface whereas the bile duct has such visible vessels.

Cystic artery and right hepatic artery

The cystic artery is a branch of the right hepatic artery (RHA) and is usually given off in the Calot's triangle. It has a variable length and enters the gallbladder in the neck or body area. The course and length of the cystic artery in the Calot's triangle is variable. Although classically the artery traverses the triangle almost in its center, it can occasionally be very close or even lower than the cystic duct.

It usually gives off an anterior or superficial branch and a posterior or deep branch. This branching usually takes place near the gallbladder. When the point of dissection is very close to the gallbladder as in a LC or the branching is proximal, one may have to separately ligate the two branches. Also if the presence of a posterior branch is not appreciated it can cause troublesome bleeding during posterior dissection.

The RHA normally courses behind the bile duct and joins the right pedicle high up in the Calot's triangle. It may come very close to the gallbladder and the cystic duct in the form of the 'caterpillar' or 'Moynihan's' hump. Although the incidence of this variation is variable it seems common enough to merit detailed description and may be as high

as 50%. If such a hump is present, the cystic artery in turn is very short. In this situation the RHA is either liable to be mistakenly identified as the cystic artery or torn in attempts to ligate the cystic artery. The ensuing bleeding in turn predisposes to biliary injury.

There are a fair number of other arterial variations of the cystic artery also described. Many of these are unlikely to cause confusion if the artery is divided very close to the gallbladder wall. There is a 2-15% incidence of double cystic artery. Therefore it may be occasionally necessary to ligate two arteries to the gallbladder. When the cystic artery is given off not from the RHA but from other vessels like the common hepatic artery or the left hepatic artery (2-5%) it crosses the bile duct anteriorly and may be prone to injury. Also the superior mesenteric artery may give off the cystic artery in which case it ascends to the gallbladder below the cystic duct. An accessory or replaced RHA from superior mesenteric artery which is a variation seen in almost 15% of individuals the RHA courses thru the Calot's triangle (and therefore nearer the gallbladder) and in turn has a shorter cystic artery.

Accessory and aberrant ducts:

There are a large number of accessory ducts described in the biliary drainage network of the liver. These ducts are typically small and course through the Calot's triangle (and therefore closer to the gallbladder) before they enter the common hepatic duct separately below the

confluence of the right and left duct at variable distances. Sometimes the cystic duct may actually join the accessory duct.

Some of these ducts may drain substantial portions of the right lobe of the liver, either one of the sectors (two segments) or a segment and may in fact be the sole drainage of that part of the liver in which case they are more precisely termed as 'aberrant' ducts. It has been suggested that most such ducts are aberrant rather than accessory in which case it is even more important to safeguard them. If such a duct is injured it can lead to substantial biliary stasis or leak. The size of the duct may be an indirect indicator of the amount of liver it drains. It has hence been recommended that in case of injury if the duct is more than 3 mm it should always be drained into a Roux loop. Alternatively one can perform a cholangiogram through the duct to assess the amount of liver it drains as well as whether it is accessory or aberrant. With increasing recognition of injury to such ducts these have now been grouped into separate type in the recent Strasberg classification of bile duct injuries.

Calot's triangle

This famous triangle was described as bound by the cystic duct, the common hepatic duct and the cystic artery in its original description by Calot in 1891. In its present interpretation the upper border is formed by the inferior surface of the liver with the other two boundaries being the cystic duct and the common hepatic duct. Its contents usually include the

RHA, the cystic artery, the cystic lymph node (of Lund), connective tissue, and lymphatics. Occasionally it may contain accessory hepatic ducts and arteries as discussed previously. It is this triangular space, which is dissected in a cholecystectomy to identify the cystic artery and cystic duct before ligation and division. In reality, it may be a small potential space rather than a large triangle making the dissection of its contents without damaging the bordering structures the most challenging step of a cholecystectomy. In addition the space may be obscured and shrunken by various mechanisms. The left (or medial) boundary of the triangle formed by the common hepatic duct is the most important structure, which needs to be safeguarded.

Laparoscopic Anatomy:

The different anatomical 'laparoscopic view' of the area around the gallbladder especially the Calot's triangle does contribute to misidentification of structures. The method of retraction during the laparoscopic procedure tends to distort the Calot's triangle by actually flattening it rather than opening it. Also, the reluctance to (or difficulty in) performing a fundus first cholecystectomy during the laparoscopic procedure as opposed to the open procedure also contributes to the same lack of exposure of the Calot's triangle. Finally, the 'posterior' or 'reverse' dissection of the Calot's triangle, which is popular during an LC, again gives a different view of the area and since the gallbladder is flipped over

during this method may lead to further anatomical distortion. The Rouviere's sulcus is a fissure on the liver between the right lobe and caudate process and is clearly seen during a LC during the posterior dissection in a majority of patients. It corresponds to the level of the porta hepatis where the right pedicle enters the liver. It has hence been recommended that all dissection be kept to a level above (or anterior) to this sulcus to avoid injury to the bile duct. Also, this being an 'extrabiliary' reference point it does not get affected by distortion due to pathology. Similarly, a clear delineation of the junction of the cystic duct with the gallbladder along with the demonstration of a space between the gallbladder and the liver clear of any other structure other than the cystic artery (safety window or critical view) is also recommended as an essential step to prevent bile duct injury.

Investigations to assess the anatomy:

Most cholecystectomies are performed after identification of gallstone disease on ultrasound examination. Although on occasion an ultrasound examination can predict gross distortions of anatomy like the Mirizzi syndrome, in the usual case it does not throw any light on anatomical relations. Thus knowledge of the specific anatomy in that individual is not available to the surgeon preoperatively as a routine. If a cholangiogram in the form of a magnetic resonance cholangio pancreatography (MRCP) or an endoscopic retrograde

cholangiopancreatography (ERCP) has been performed for some reason, it may reveal anomalies like the presence of accessory ducts or a low insertion of cystic duct.

Methods to assess anatomy during the surgery are perhaps more relevant. The first and foremost (and perhaps the most reliable) is clean dissection and accurate visual identification of the contents of the Calot's triangle especially the cystic artery and duct. The role of a routine intraoperative cholangiogram in delineating biliary anatomy and in turn preventing misidentification has been a subject of a long and intense debate amongst biliary surgeons but there is conflicting evidence on its value. In reality most biliary surgeons do not perform a routine intraoperative cholangiogram but use it selectively. Also a cholangiogram may not delineate all aberrant ducts and does not provide any insight into arterial anatomy.

This use of laparoscopic ultrasound for identification of structures, laparoscopic Doppler for identification of arteries and the use of an instrument called the tactile sensor probe. Some recent reports describe innovative methods such as the injection of a dye called methelenum coeruleum into the gallbladder which gives a blue color to the biliary system and the introduction of a small optical fiber through ampulla of vater which illuminates the entire biliary tree during the cholecystectomy a procedure called 'light cholangiography. Most of these methods rely on

costly technology, are largely unavailable and have not been scientifically validated. Thus, it seems that presently there is no good alternative to meticulous dissection in a planned manner with precise identification of structures before they are divided.

Cholelithiasis

There has been marked rise of gallstone disease during the past century. Prevalence rate varies from less than 1% (in Africa) from 38 %(in Sweden).The prevalence in females is approximately twice that of male. In India the prevalence is about 6% and incidence in north India is significantly higher than south India (4).

Pathological features (5)

Bile has three major constituents:

- Bile salts (primary: cholic and chenodeoxycholic acids; secondary: deoxycholic and lithocholic acids).
- Phospholipids (90% lecithin).
- Cholesterol.

Bile containing excess cholesterol relative to bile salts and lecithin is predisposed to gallstone formation.

Types of gallstones:

- Pure cholesterol (10%). Often solitary, large (> 2.5cm), round.
- Pure pigment (bile salts; 10%). Pigment stones are of two types**:**

  Black (associated with haemolytic disease)

  Brown (associated with chronic cholangitis and biliary parasites).
- Mixed (80%). Most common; usually multiple.

Predisposing conditions:

- Increasing age.
- Female (pregnancy and use of the oral contraceptive).
- Obesity.
- Multiparity.
- Chronic haemolytic disorders (only for pigment stones).
- Long-term parenteral nutrition (alteration of bile constituents).
- Previous surgery (e.g. vagotomy or resection of the terminal ileum) or disease involving the distal small bowel (e.g. Crohn's disease) alteration of bile constituents.

Clinical features (common presentations)

- Biliary colic
- Intermittent severe epigastric and right upper quadrant; usually associated with nausea and vomiting. Resolves after a few hours; tenderness over gallbladder during acute episodes.
- Acute cholecystitis
- Severe continuous right upper quadrant pain; often radiates to right flank and back associated with anorexia and pyrexia. Tenderness over gallbladder during inspiration (Murphy's sign).

Complications of acute cholecystitis include:

- Formation of an empyema or abscess of the gallbladder (rare) indicated by high swinging fever and severe localized pain;
- Perforation with biliary peritonitis (very rare);
- Cholecystoenteric fistula formation (may lead to a gallstone entering and obstructing the distal ileum
- Jaundice due to compression of the adjacent common bile duct by swelling (Mirizzi syndrome).

Chronic cholecystitis:

A mucocele of the gallbladder or infection producing an empyema.

Diagnosis and investigations:

- Full blood count, Urea & Electrolytes, LFTs, blood culture, serum amylase in acute presentations
- Abdominal X-ray. Only 10% of calculi are radio-opaque.
- Oral cholecystogram (Graham-Cole test): rarely used.
- Ultrasound procedure of choice. Identifies stones, determines wall thickness, and assesses ductal dilatation.
- Hepatobiliary iminodiacetic acid (HIDA) scan: useful when ultrasound findings are equivocal.

Surgical treatment:

Cholecystectomy:

Vast majority done laparoscopically. Often done as a day case. This is the treatment of choice for all patients fit for General anaesthesia.

Indicated for:

- Patients with symptoms deemed to be due to gallbladder stones;
- Asymptomatic patients with gallbladder stones at risk of complications (diabetics, porcelain gallbladder (15-20% associated with carcinoma), history of pancreatitis, long-term immunosuppressed).

Non-surgical treatments:

- Percutaneous drainage of gallbladder
- Done under ultrasound or Computed Tomography guidance.
- Used for empyema of the gallbladder in patients unsuitable for emergency cholecystectomy.
- After resolution of the infection the calculi may be removed percutaneously.

Dissolution therapy:

- Rarely used. Requires a functioning gallbladder, small stones.
- Problems: requires prolonged treatment, less than 70% response, high rate of recurrence of stones, toxicity of medication.

- Extracorporeal shock wave lithotripsy
- Hardly ever used. Risk of visceral injury and high risk of stone recurrence.

SURGICAL PROCEDURES

Cholecystectomy:

Indications[6] :-

- Cholelithiasis – with or without symptoms
- Acute or chronic cholecystitis – with or without stones
- Symptomatic gall bladder polyps
- Gall bladder carcinoma
- Torsion of gall bladder
- Traumatic rupture of gall bladder or cystic duct
- Biliary peritonitis – with or without demonstrable perforation
- Internal biliary fistula
- Gas in the gall bladder
- Non functioning gall bladder

Contraindications:

For open cholecystectomy:

- Asymptomatic gall stones or producing little trouble on poor risk, aged and feeble patients
- Patients with medical disorders like cirrhosis, CVA, CAD

Laparoscopic Cholecystectomy :

Contraindications[6] **:**

1. Absolute:

- Peritonitis or cholecysto-enteric fistula
- Acute Pancreatitis
- Cholangitis
- Portal Hypertension
- Pregnancy
- Major bleeding disorder
- Carcinoma of gall bladder
- Morbid obesity

2. Relative:

- Prior abdominal surgeries
- Empyema gall bladder
- Common bile duct stones
- Cirrhosis of liver.

TECHNIQUE OF OPEN CHOLECYSTECTOMY

Pre-Operative Assessment:

After appropriate history taking and assessment of the patient's fitness for the procedure, patient is given prophylactic antibiotics either with the premedication or at the induction time. Anti-thrombotic prophylaxis is undertaken and a consent form is signed.

Operation:

The surgeon should have a perfect knowledge of anatomy with congenital anomalies to minimize the complications.

Operation technique:

The patient is placed in the dorsal recumbent position. For obese patients the table is placed in a slight reverse Trendelenburg position to aid the downward displacement of liver.

Incision:

The Kocher's right sub-costal incision is especially useful in patients who are very obese or in whom the costal angle is wide. Vertical incisions, either midline, right paramedian using a muscle slide technique or a muscle split are also quite satisfactory.

The gall bladder is appropriately exposed and the packs are placed on the hepatic flexure, duodenum and lesser omentum and retracted.

The gall bladder if found distended is emptied by aspirating bile using a syringe. One of the two methods can then be followed:-

1. Retrograde cholecystectomy:

Here, the peritoneum overlying Calot's triangle is placed on stretch and divided close to the gall bladder wall. The fat on Calot's triangle is dissected to expose cystic artery and cystic duct. The cystic duct is cleared down to CBD and the cystic artery is tied and divided. Then the cystic duct is divided between ligatures.

2. Ante grade/ Fundus first method:

It is done when anatomy is not clear. Here mesentery of the gall bladder is incised close to liver at a point above the neck of the gall bladder and with finger dissection body and fundus of gall bladder is detached from the GB fossa with minimum trauma to the liver tissue. Then the cystic artery and cystic duct are approached and divided between ligatures.

Modifications of fundus first method:-

- **Espiner's modification -** is particularly suitable for thickened and inflamed gall bladder where dissection of GB from its bed is carried out in the sub mucosal plane using diathermy. This obviates the requirement to control the cystic artery and minimize the risk to CBD.
- **Lahey's method**- When GB is found to be inflamed and friable, no clamp or haemostat is applied. The medial peritoneal reflection of gall bladder is incised close to the liver and above the neck. A

finger is passed behind the GB in the layer of fascia over the liver and swept upwards from its fossa. The body and fundus of gall bladder is detached from the liver after which the cystic artery and cystic duct are clearly displayed and dealt with.

After the gall bladder is extracted, haemostasis is secured and the abdomen closed with or without drain.

Intraoperative problems:

It arises in the following situations:-

1. Narrow CBD- Here dissection is commenced close to the GB neck and cystic duct is ligated at GB neck.
2. Moynihan's hump- Prior to dividing cystic artery it is traced back to its origin and properly identified.
3. Acute inflammation- Here fundus first method is preferable.
4. Portal hypertension- Here the chances of injury to liver are high with increased bleeding tendency.

EQUIPMENTS AND INSTRUMENTS FOR LAPAROSCOPIC CHOLECYSTECTOMY

Video laparoscopic surgery has been made possible by the major advances in video technology. The combination of equipment and the skills to use the equipment constitute the essentials in laparoscopic surgery.

Essential Equipments:

Light Source:

A high intensity light source such as Xenon with variable intensity and a light filter provides adequate visualization of abdominal cavity at various distances.

Fibre optic light guide cable:

A 5mm thick, 225cm long cable is desirable. A thick cable carries more light and a long cable is more convenient and less likely to be stretched.

Video camera:

To maximize the visualization of structure, single chip and viewing camera having 480 lines/ inch resolution is the minimum requirement. It is attached to the scope and cable hooked to a processor that transmits the image to video monitor. The 3 chip cameras (700 lines/inch resolution)

are expensive, but provide the best image. All cameras require white balancing.

Laparoscope:

It is based on the Hopkins rod lens system. It is available in many sizes, 10mm, 7mm, 5mm and the new 2mm. It may have 0^0 forward views or 30/ 45^0 angled views. Telescope tips fog due to temperature differences outside and inside the patient. This is aggravated by the cold insufflation. Warming the telescope in warm water before use and touching the tip to the liver surface avoids fogging.

High flow insufflator:

It is used to insufflate carbon dioxide to create pneumoperitoneum. As a safeguard, it also monitors the intra abdominal pressure constantly to stop the flow once 12mm Hg of pressure is achieved and also has indicators for rate of flow and total volume of gas delivered. A rate of 8-10 L/min delivery is ideal but at least 6L/min is the minimum required. Carbon dioxide is the standard gas used for creation of pneumoperitoneum**.** It can be insufflated directly into the blood stream in volumes up to 100L/min without serious metabolic effect. It suppresses combustion and appears to be innocuous to the tissues of peritoneum.

High resolution video monitor:

It should be capable of 480 Hz lines/ inch for one chip camera and 700Hz lines/inch for three chip camera. Monitors should be at least 13 inch in size for adequate visibility and must be grounded. For teaching and documentation, printers and video recorders are invaluable.

Irrigation device:

A pressure of 300 mm Hg is usually used to irrigate the abdomen - either manual or powered. The irrigation/ aspiration probes may have a single channel for both these functions or separate channels. Heparin 1000U/L may be added to the irrigation fluid to minimize clot formation.

Electro-cautery:

It is used to dissect gall bladder from the bed and achieve adequate haemostasis. It uses electrons to produce heat and to dissect and coagulate tissues.

Instruments:

It includes highly specialized and innovative devices used to ensure safety of the procedure.

Veress needle

It is used to insufflate abdomen. A metal sheath covers the needle tip and retracts as the needle penetrates the abdominal wall and springs to cover the tip once the needle is in the abdomen. It prevents the laceration

of abdominal organs during insufflation. It is connected to the tubing from insufflator to establish pneumoperitoneum.

The Hassan trocar system is designed for use with open technique. This approach is particularly useful in patients who have a previous laparotomy and suspected adhesions near the site of proposed needle insertion.

Trocars and cannulas:

Trocars for introduction of telescope and instruments are in two sizes i.e.11mm and 5.5mm. The trocar consists of a metal tube with a sharp conical or pyramidal tipped obturator. The outer surface of the cannula has a dull finish to minimize reflection of light in the abdomen. Gas escape is prevented by a flap gate or trumpet valve. All trocars have stop cocks through which carbon dioxide can be insufflated or smoke evacuated.

Retractors/ Graspers:

These are useful for grasping and retracting thick walled structures or extracting gall bladder from the abdomen. They are 5.5mm in diameter with jaws at the tip and handles with ratchets. They are inserted through two lateral cannulas and retract gall bladder and fundus.

Dissectors and scissors:

These are used for dissecting tubular structures, passing ligatures and pin point diathermy. They have thin elongated jaws. Maryland

dissector has jaws bent at the tip. Hook scissors can cut and grasp tissues with tip and pull them out. Straight scissors or micro scissors are used for division of cystic duct and cholangio- catheter placement.

Occlusion clip applicators:

These come in 3 sizes- medium, medium large and large. These are used to clip cystic artery and cystic duct.

Coagulators:

These are used to cut or coagulate. Hook or spatula is used for dissection or coagulation.

TECHNIQUE OF LAPAROSCOPIC CHOLECYSTECTOMY

Consent:

A fully informed written consent is taken informing about the laparoscopic procedure, its complications and the need, if necessary for conversion to open cholecystectomy. It also includes the cholangiography and CBD exploration if planned.

Anaesthesia:

It is done under general anaesthesia with controlled ventilation and monitoring of end tidal carbon dioxide and pulse oximetry. $ETCO_2$ is most commonly used as a non invasive substitute for $PaCO_2$ in evaluating the adequacy of ventilation. Appropriate measures are taken to prevent DVT, respiratory complications and cardiac complications.

Position:

Patient is placed in supine position with 15^0 head tilt which improves diaphragmatic function and respiratory status. Catheterization is done if the bladder is found to be full.

Operating room set up:

Most surgeons utilize two video monitors, one on each side of the operating table to facilitate visualization by both surgeons and assistant. Using the American technique the surgeon stands to the left of the patient

the first assistant stands to the patient's right, and the laparoscopic video camera operator stands to the left of the surgeon. In the French technique, the patient's legs are abducted and the surgeon stands between the legs.

Procedure:-

Creating pneumoperitoneum:

A transverse sub umbilical incision of around 1-1.5cm long is made extending through the subcutaneous fat up to the rectus sheath.

The abdominal skin below the umbilicus is lifted up sharply using an abdominal swab for a good grip. The shaft of the Veress needle is held between the thumb and three fingers and the needle is gently inserted into the abdomen at 45^0 angle pointed towards the pelvis with slow and deliberate movement. After hearing two snaps (first- rectus sheath, second- peritoneum), the needle is swung from side to side to ensure that its movement is free and not restricted by adhesion. The 'saline drop test' and injection- aspiration of saline is done to confirm the needle tip in the peritoneal cavity.

The gas insufflation tube is then attached to the needle hub and insufflation started at 1-2L/min. A low intra-abdominal pressure (<5mmHg) and a steady flow gas (0.5-1.5L/min) indicates the intracoelomic position of the needle.

Insertion of trocar and cannula:

The gas pressure is allowed to build up to 12-14mmHg before introducing first blind trocar. The trocar and cannula is held in a way the tennis racket is held with the index finger extended along the shaft towards tip and hub of trocar resting over volar surface of wrist joint. It is inserted at 45^{0} angle pointed towards pelvis and with a rotatory movement till the tip enters the peritoneum. A loss of resistance indicates entry into gas filled peritoneal cavity.

The telescope is now inserted to view the peritoneal cavity and the CO_2 gas tube from the insufflator is connected to the gas inlet cork.

The open technique for pneumoperitoneum is useful in the presence of adhesions and in difficult cases. It avoids all the risks of injury of the blind technique. A purse string suture is placed around the Hassan's trocar to reduce an air leak and fixed to the cannula.

The tip of the telescope is kept warm by dipping it in warm saline or anti-fog solution or with povidone, which acts as a surfactant.

Other ports are introduced under vision:

- The right lateral 5mm port in the anterior axillary line – to hold the grasper that grasps the fundus and pushes the gall bladder and liver up.

- The epigastric 10mm port – to support the various instruments used by the surgeon. A reducer fitting into this port facilitates the switching over between 10mm and 5mm instruments.
- The sub costal mid-clavicular 5mm port- takes the grasper that is used to give counter-traction.

Separation of gall bladder adhesions:

The fundus of the gall bladder is held by the mid-axillary trocar and retracted cranially. Through the mid clavicular trocar, the fundus is held and retracted and adhesions separated from the gall bladder working against the counter traction of the left hand forceps. Starting at the area closest to the fundus the adhesions are gradually separated towards Hartman's pouch. This is proceeded till the entire body of gall bladder is freed of all adhesions and Hartman's pouch is clearly defined.

Dissection and skeletonisation of cystic duct and cystic artery— Further dissection is commenced by division of the peritoneal fold between Hartman's pouch and liver. A posterior window is created at the GB- cystic duct junction and continued medially clearing cystic duct. Next anterior dissection is started and the cystic duct cleared. The cystic artery is identified and both the structures are skeletonised from the common hepatic duct and the branch of cystic artery to the cystic duct is identified and divided.

The bleeding points are pin point coagulated as they are seen. The dissection field is flushed with normal saline and heparin. The dissected cystic duct and cystic artery are clip occluded – two on the body side and one at the neck of the gall bladder and duct divided close to the clip on the specimen side. The artery is similarly divided.

Excision and extraction of gall bladder— with the cystic duct and cystic artery divided, traction is applied at the left hand at the neck of the gall bladder and GB is dissected off the liver bed. The dissection is started at the neck and worked towards the fundus using either sharp division or with hook. The final fundus connection is undivided and gall bladder is used for traction to examine the liver bed for any bleeding which is then coagulated. After securing haemostasis, abdomen is irrigated and sucked clean and carefully examined for fluid collection in pelvis and sub diaphragmatic areas and aspirated.

A drain is inserted through the lateral trocar and positioned in the sub hepatic region. With traction on the gall bladder, the peritoneal fold at the fundus is carefully divided.

Once the gall bladder is completely freed, a grasping forceps is introduced through the epigastric trocar; neck of the GB is grasped and is drawn to the trocar sheath. The GB neck is drawn into the 10mm trocar and is gradually extracted from the abdominal cavity with the gall bladder. The GB neck is grasped on its coming out, stone extracted with

forceps and GB is extracted using firm rotatory movement. Peritoneal cavity is re-examined and as much gas as possible is evacuated and 10mm trocar withdrawn.

Closure of incision:

Any prolapsing bowel or omentum is carefully reduced and the sheath is sutured with vicryl/ prolene. All skin incisions are closed and the drainage tube is connected to the bottle and covered with dressing.

The gall bladder is opened and examined and sent for histopathology.

Advantages and Disadvantages:

The advantages of LC over other therapies for gallstone disease are multiple. Relative to traditional OC, postoperative pain and intestinal ileus are diminished with LC. The small size of the fascial incisions allows rapid return to heavy physical activities. The small incisions are also cosmetically more appealing than is the large incision used during traditional cholecystectomy. The patient can usually be discharged from the hospital either on the same day or the day following operation, and can return to full activity within a few days.[11,12] These factors lead to overall decreased cost of LC compared to its traditional open counterpart.

Advantages and disadvantages of lap. Cholecystectomy(9)	
Advantages	**Disadvantages**
Less pain	Lack of depth perception
Smaller incisions	View controlled by camera operator
Better cosmesis	More difficult to control hemorrhage
Shorter hospitalization	Decreased tactile discrimination (haptics)
Earlier return to full activity	Potential CO_2 insufflation complications
Decreased total costs	Adhesions/inflammation limit use
	Slight increase in bile duct injuries

There are, however, several potential disadvantages of LC. Three-dimensional depth perception is limited by the two-dimensional monocular image of the videoscope, and the operative field of view is usually directed by an individual other than the surgeon. It is more difficult to control significant hemorrhage using laparoscopic technology than in an open surgical field. There is also less tactile discrimination of structures using laparoscopic instruments as opposed to direct digital palpation during OC. CO_2 insufflation to create the pneumoperitoneum is associated with a number of potential risks, including reduction of vena

caval flow and systemic hypercarbia with acidosis. Operative time is generally longer than for the traditional open operation, particularly during the early portion of the surgeon's experience. And finally, the videoscopic technology and minimal access instrumentation are costly, complex and continually evolving requiring the presence of appropriately trained support personnel.

Complications of laparoscopic cholecystectomy

Laparoscopic Cholecystectomy.(9)

Complications of LC

- Hemorrhage
- Bile duct injury
- Bile leak
- Retained stones
- Pancreatitis
- Wound infection
- Incisional hernia

Pneumoperitoneum related:

- CO_2embolism
- Vaso-vagal reflex
- Cardiac arrhythmias
- Hypercarbic acidosis

Trocar related:

- Abdominal wall bleeding, hematoma
- Visceral injury
- Vascular injury

Of all the potential complications, biliary injuries have received the most attention. Most series quote a major bile duct injury rate of around 0.2% during OC, whereas the incidence of bile duct injuries during LC is 0.40% or higher.[10] These injuries can cause major morbidity, prolonged hospitalization, high cost and litigation.[13,14] In addition to the surgeon's experience and aberrant anatomy, a number of reports mention chronic inflammation with dense scarring, operative bleeding obscuring the field, or fat in the portal area contributing to the biliary injuries.[15,16] The classic biliary injury, however, occurs when the CBD or a right hepatic duct is mistaken for the cystic duct and is divided between clips. Many surgeons attribute this misidentification to the direction of traction of the gallbladder, i.e., pulling the CBD and the cystic duct into alignment, thus making them appear to be one. Other contributing factors to misidentification are a short cystic duct, a large stone in Hartmann's pouch (making retraction and display of the cystic duct difficult), or tethering of the infundibulum to the CBD by acute or chronic inflammation. If a bile duct injury occurs, an immediate repair should be performed. When a bile duct injury is discovered in the postoperative period, a coordinated effort by radiologists, endoscopists and surgeons is

necessary to optimize management. There should be no hesitation in asking for the help of a surgeon experienced in biliary repair.

Conversion:

Conversion to the open technique is a universal phenomenon. The conversion rates vary according to the selectivity with which the surgeon takes up cases for LC. The rates range from 2-15% and are higher in acute cholecystitis. The following reasons were attributed for conversion

1. Dense omental and visceral adhesions
2. Post operative adhesions
3. Uncontrollable bleeding from liver and cystic artery
4. Obscure anatomy
5. Pneumoperitoneum related complications
6. Common bile duct injury
7. Obesity
8. Acute cholecystitis
9. Carcinoma gall bladder
10. Spillage of stones
11. Instrument and equipment failure

Post operative period:

Patient is kept nil by mouth for 24-36 hours and is discharged once he/she tolerates orally. Patient is monitored for pain, fever, jaundice and ileus.

MATERIAL AND METHODS

The study subjects consisted of 81 patients with a diagnosis of calculous cholecystitis that underwent cholecystectomy at Tirunelveli medical college Hospital, Tirunelveli-11 from July 2007 to December 2009. The patients were interviewed for detailed clinical history according to a definite proforma. All the patients were examined and underwent routine blood investigations with LFT wherever necessary. Abdominal USG was performed in all the cases.

Inclusion Criteria:

Patients with cholelithiasis proven by USG with at least one attack of upper abdominal pain and considered fit for elective cholecystectomy were included in the study.

Exclusion Criteria:

The patients with following conditions were excluded from the study:

- History or investigations suggesting CBD stones.
- Patient's underwent surgery for acute cholecystitis
- Patient's who underwent surgery for complications like empyema gall bladder, perforation gall bladder.

Written informed consent was obtained from all the patients before their enrolment in the study. The study protocol was approved by the local ethical committee of this hospital.

All patients were kept nil by mouth overnight prior to surgery and received antibiotic prophylaxis. Nasogastric tube was inserted depending on individual basis and all patients were asked to empty the bladder prior to entering the operating room.

Surgical Procedure:

All operations were performed by the consultant surgeon. All operations were done under General Anaesthesia.

Open Cholecystectomy:

A sub costal muscle transection incision was used for open cholecystectomy; the length of the incision was tailored to the individual patient and kept to the minimum necessary to allow safe and adequate access to the gall bladder. Dissection was started at Calot's triangle and proceeded antegradely towards the fundus. "Fundus first method" was used in case of dense adhesions where anatomy of Calot's triangle was not clear.

Laparoscopic Cholecystectomy:

Laparoscopic cholecystectomy was performed with the operating surgeon on the left side of the table and also by French set up. its up to the surgeons choice. Pneumoperitoneum was created using Veress needle

and by Hassan's technique in some cases. It involved two 10mm and two 5mm trocars. Peritoneal cavity was visualized and any adhesions if present were released. Calot's triangle was visualized and dissection was carried out by means of electrocautery and the cystic duct and artery were secured with titanium clips. At the completion of the operation, a sub hepatic drain was inserted as required in both the groups. Once the patients were reversed from anaesthesia, they were shifted to recovery room for observation for an hour and then shifted to the post op ward.

All patients were administered NSAID's or opioid analgesics and anti-emetics as required. Patients were allowed liquids once bowel sounds returned. Patients were discharged from the hospital once they were fully mobilized and able to tolerate a normal diet and pain relief was adequate. Pain in the post op period was rated by each patient using a Visual Analogue Scale (from 0 to 5). Patients were encouraged to resume work and normal daily activity as soon as possible. Evaluation of return to normal work and post op complications was made during an OPD appointment 4 weeks after surgery.

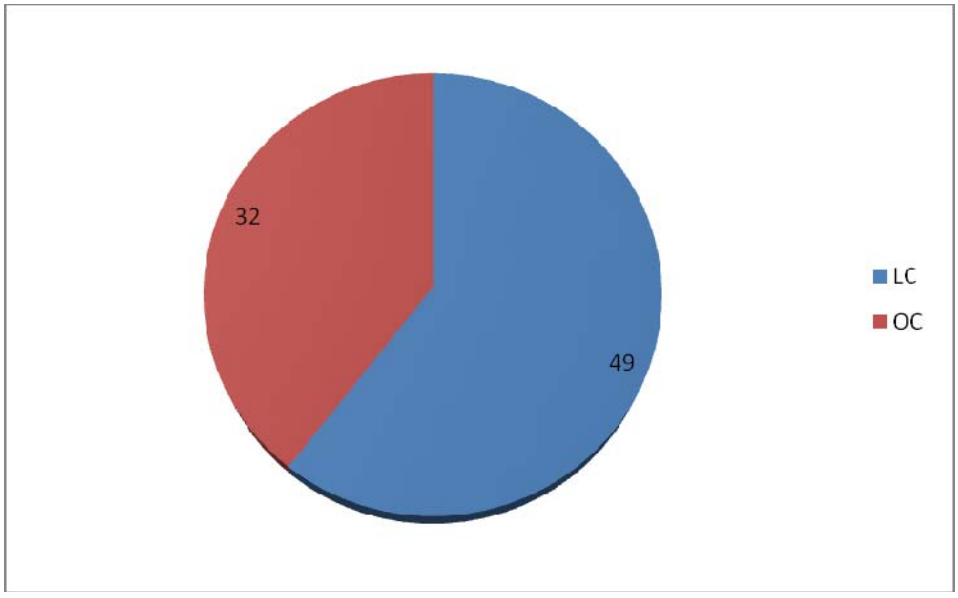
Data was collected included patient's demographics, laboratory results, and operative findings, requirement for conversion to open cholecystectomy, operating time (from incision to closure), operative complications, and duration of post-operative pain, analgesic administration and length of hospital stay along with post-operative complications if any. The total cost incurred during hospitalization was recorded. The histopathology of the specimen was also noted.

OBSERVATIONS AND RESULTS

This study was conducted during a two and half year period from July 2007 to December 2009, a total of 81 cases of Cholecystectomy were studied. Of these, 49 patients underwent laparoscopic Cholecystectomy and 15 patients underwent open type and 5 patients had to be converted to open type.

The results were:

Cases of Cholecystectomy - Types



Patient's demographics:

1. Sex Distribution:-

Table 1:

Sex	LC	OC
Male	11	9
Female	38	23

9 patients of OC and 11 patients of LC were males. Among OC group 23 were females and among LC group 38 were females.

Sex Distribution

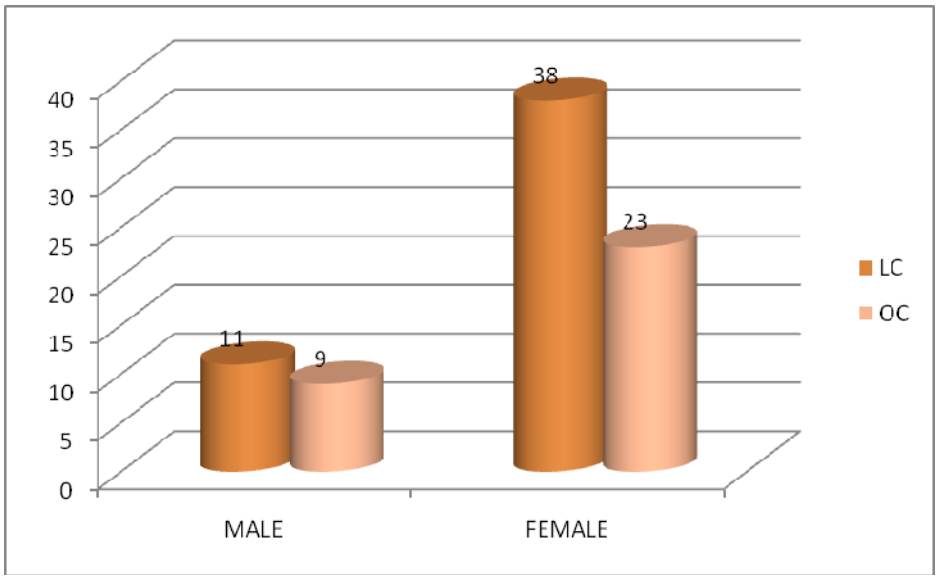
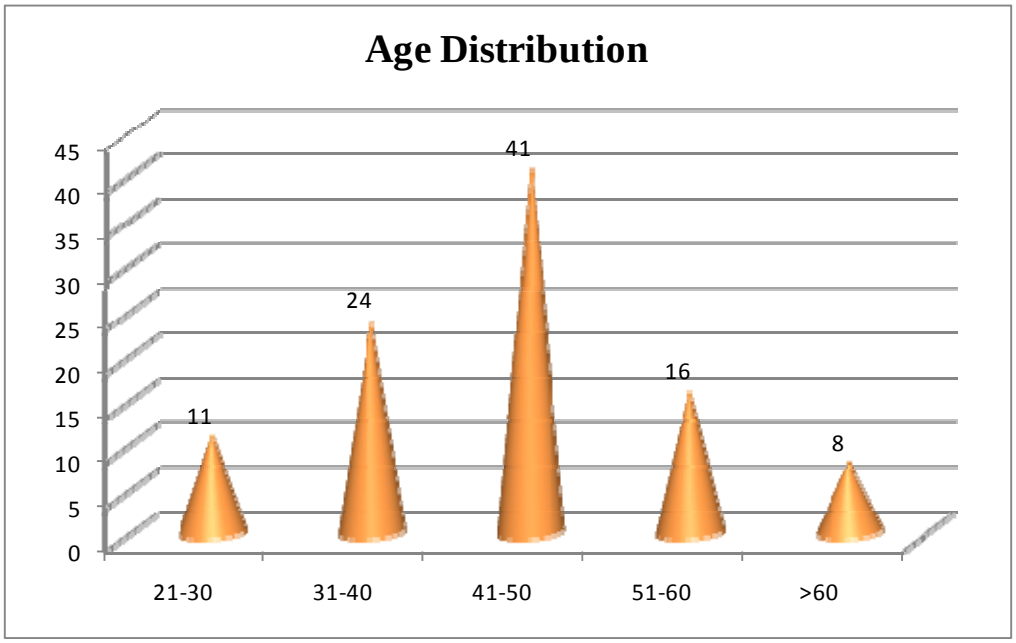


Table 2: Age Distribution

Age	No.	Percentage
21-30	9	11
31-40	19	24
41-50	33	41
51-60	13	16
60 and more	7	8

About 65% patients fall between the ages of 31-50

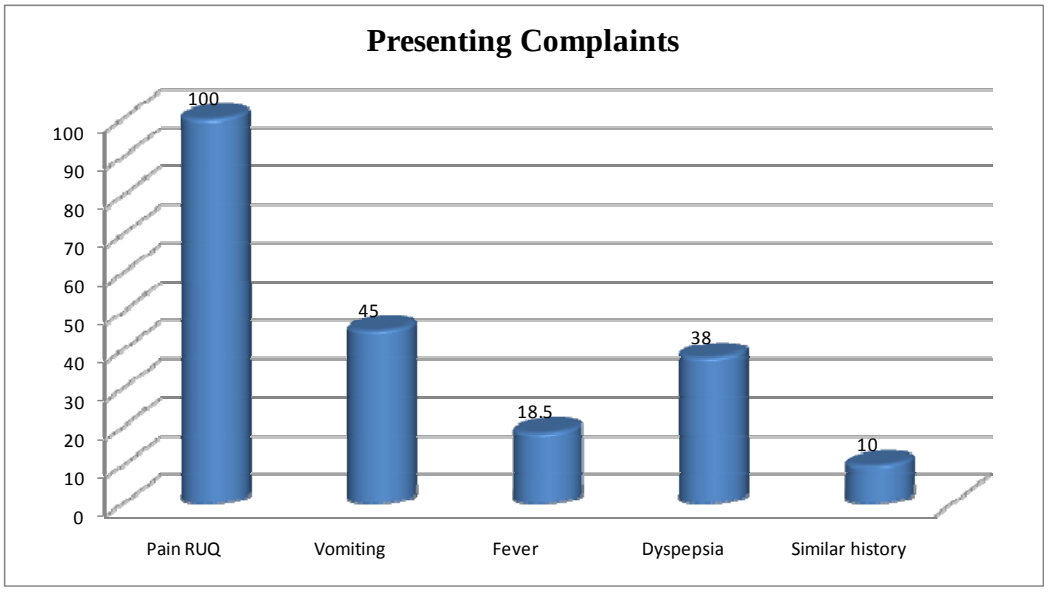


Presenting complaints:

All patients were presented with abd pain and others with vomiting, dyspepsia and fever**.** Patients presented with jaundice were excluded from the study group.

Table 3: Presenting Complaints

Complaints	No	percentage
Pain RUQ	81	100
Vomiting	36	45
Fever	15	18.5
Dyspepsia	30	38
Similar history	8	10

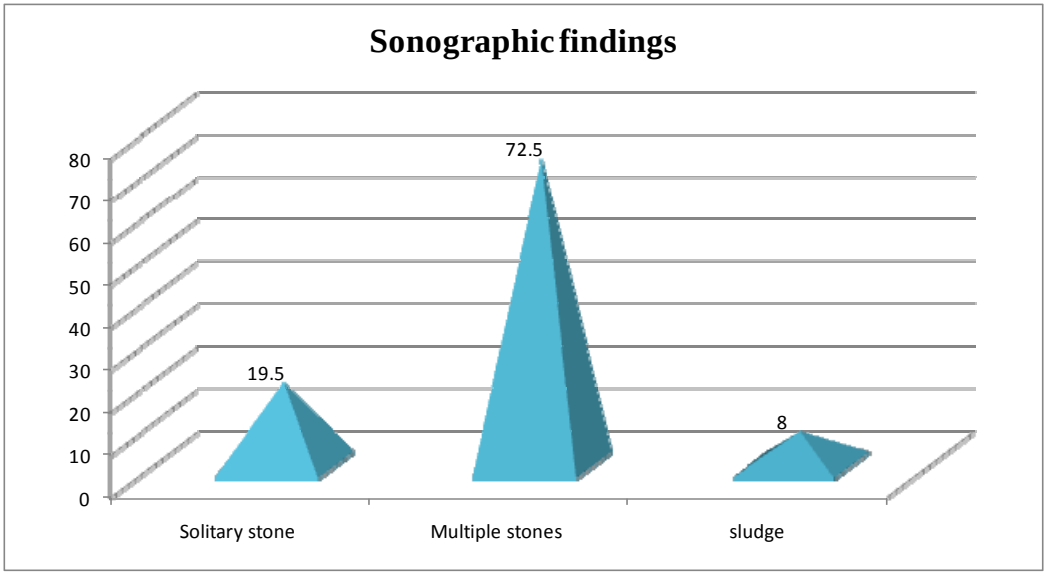


Sonographic findings:

All patients the group underwent abdominal sonography. Solitary stone was found in 16 patients of OC. Multiple stones were seen in 59 patients.

Table 4: Sonographic findings

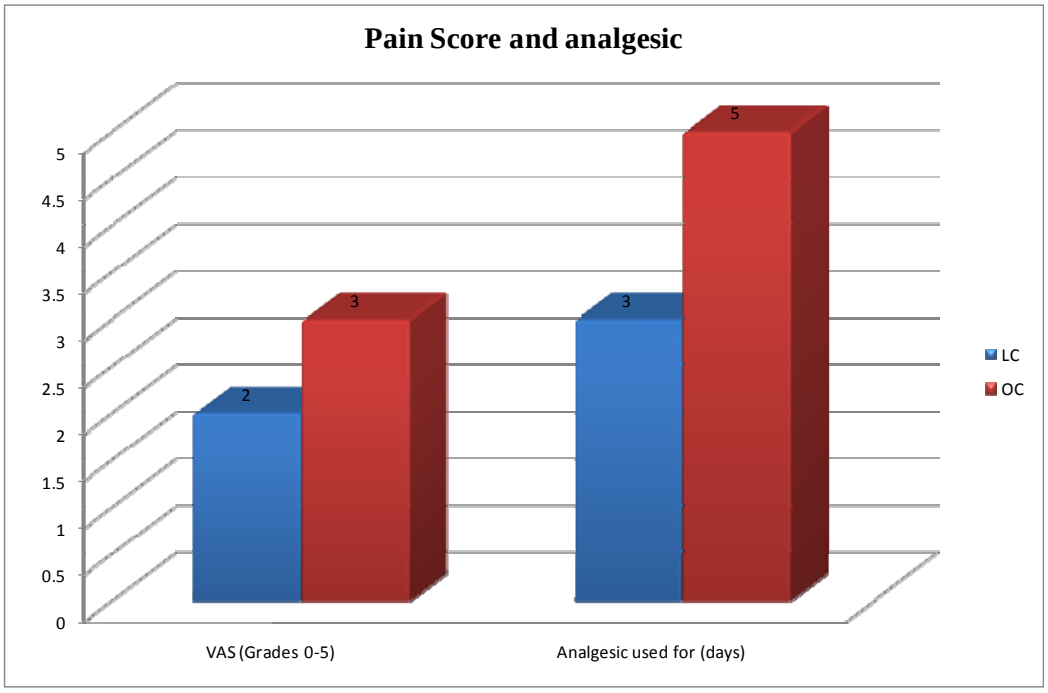
USG Findings	No	Percentage
Solitary stone	16	19.5
Multiple stones	59	72.5
sludge	6	8



Pain score and medication:

Table 5: Pain Score and analgesic

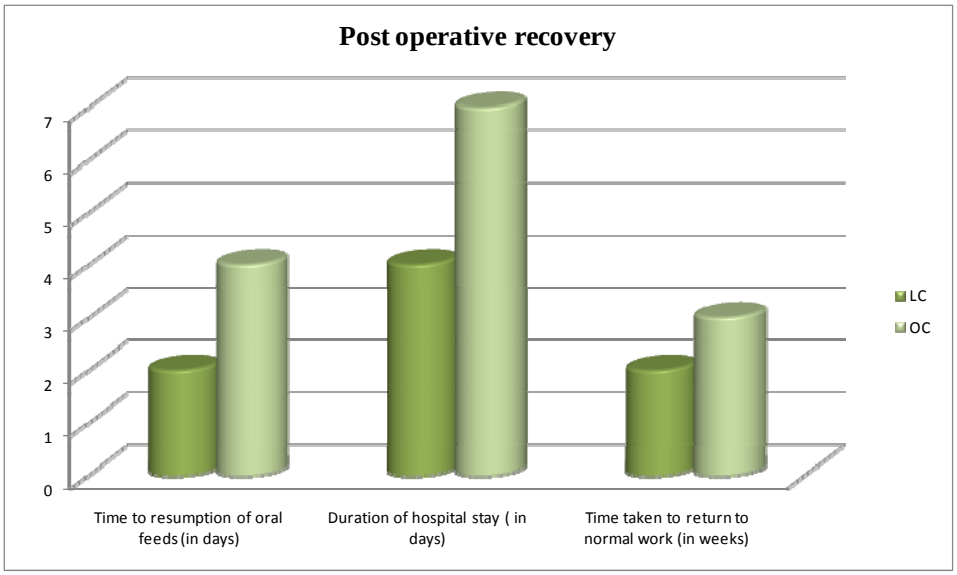
	LC	OC	p Value*
VAS (Grades 0-5) (Range)	Grade 2 (0-3)	Grade 3 (1-5)	p=0.024 (S)
Analgesic used for (days) (Range)	3 (2-6)	5 (2-10)	p=0.016 (S)



The VAS was median Grade3 in OC group as compared to median Grade2 in LC group, p=0.024. The NSAID's were used for more days in OC group (median-5days) compared to LC group (median-3days), p=0.016.

Table 5: Post operative recovery

Post operative recovery	LC	OC	p Value*
Time to resumption of oral feeds (in days)	2	4	p=0.04 (S)
Duration of hospital stay (in days)	4 (2-7)	8 (4-10)	p=0.001 (S)
Time taken to return to normal work (in weeks)	2	3	p=0.018 (S)



The duration of hospital stay was for a median period of 4days (2-8days) in LC group and 7days (4-10days) in OC group. The difference was statistically significant, p=0.001. It was more in OC group due to increased pain, wound infection, injectable antibiotics used and less mobilization due to pain and also due to our own custom of discharging the patients after suture removal.

All patients who underwent LC were able to return to normal work on an average of 2 weeks compared to 3 weeks in OC group. The difference was statistically significant, p=0.018.

Post operative outcome:

Complications	**LC**	**OC**
Wound infection	2	6
Wound dehiscence	-	1
Transient bile leak	3	2
Incisional hernia	-	1

DISCUSSION

Traditional cholecystectomy is an integral part of every surgical training programme and is performed by most general surgeons. The advent of laparoscopic cholecystectomy has created an excitement and a flurry of activity in the medical community.

This study showed that morbidity rate is more with open cholecystectomy than laparoscopic cholecystectomy. The open procedure was associated with a shorter operating time (LC 60-160min and OC 40-135min). This is comparable with that of Trondsen[7] and Porte[8]. As experience is gained, an operating time of about 50 min can be achieved, but this increases as other surgeons are trained or more challenging cases are performed. This "learning curve" represents adapting to operating in the 2-D screen, becoming familiar with the instrumentation and becoming accustomed to the technique.

In this study, there were no major complications and several minor ones. There was no peri-operative mortality and no CBD injury. The complications observed were bile leak, stone spillage and blood loss which were found to be comparable in both the groups. Drains were used in both group but the difference was not found to be significant. Harris[17] in his study found similar results. [Bile leak (LC-2%, OC-1%) and

bleeding requiring transfusion (LC-1%, OC-2%)]. Other studies also reported similar results[18, 19].

The conversion was necessary in 5 patients out of 49(10.2). Two patient required conversion due to difficult dissection in view of acute cholecystitis. Conversion rate was also found to be higher in acute cases in other studies (0-45%)

Reasons for conversion	No
Acute cholecystitis(empyema GB)	1
Dense omental adhesions with fibrotic GB	2
Bleeding- obscuring the anatomy	1
Technical and equipment failure	1

The wound infection rate in this study was found to be less in laparoscopic group being (4% in laparoscopic group versus 18% in open group). This was due to the reduced size of the incision and lesser wound. This also reduced the need for post operative antibiotics in the laparoscopy group. Due to the severe wound infection and wound dehiscence 1 patient in the OC group developed incisional hernia in the follow up period. Harris[17] also noted 1 wound infection in 100 OC patients and 0 in LC group.

Use of minimally invasive techniques in elective surgeries is associated with a reduced inflammatory stress response with improved pulmonary function and less hypoxia.

The VAS was significantly less for LC group [Grade2 (median) for LC and Grade3 (median) for OC; p=0.024]. Kum[20] also found a mean VAS score of 3.8 v/s 7.7 between LC and OC. The pain duration (median 2days for LC and median 4 days for OC patients; p=0.001) and the duration of analgesics used (median 3days for LC and median 5days for OC patients; p=0.016) also were significantly less in laparoscopic group patients. This was due to the lesser incision size in LC. Other studies have also shown similar results.[21, 22, 23,24,25,26.]

The two most beneficial aspects of LC are the short hospital stay and the rapid recovery[27.] In this study, the median duration of hospital stay was 4days for LC group and 7days for OC group. The difference was found to be statistically significant (p=0.001). Porte[8], Trondsen[7] and Lujan[28] also found similar results. This was also confirmed in various other series[21, 12, 23,25,26,29.]

The time taken to return to normal work was found to be more in OC (median 3 weeks) compared to LC (median 2 weeks). It was comparable to Schietroma[26] who found the time taken were 4.4 days for LC and 7.6days for OC patients. Other studies found that the duration of sick leave was less in LC compared to OC[30, 25.]

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CONCLUSIONS

Laparoscopic cholecystectomy is a considerable advancement in the treatment of gall bladder disease. The advantages of laparoscopic cholecystectomy are several:

- Technically, the dissection of the cystic artery and cystic duct is very precise and bleeding is easily controlled with less peri operative blood loss.
- LC is associated with less chances of wound infection and there is no risk of wound dehiscence.
- The antibiotic usage in LC is comparatively lesser than that of OC.
- The degree of post operative pain and its duration is less.
- The amount of analgesic requirement is less in LC.
- LC patients tolerate oral feeds earlier and are mobilized faster.
- . The duration of hospital stay is less and patients can be discharged quickly from the hospital.
- Patients of LC group can resume their work earlier.
- . The cosmetic advantage in LC is obvious.

Cholecystectomy remains a common operation. Laparoscopic management of symptomatic gallstones has rapidly become the new standard for therapy throughout the world. Many patients can now undergo this operation in an ambulatory setting. There are numerous advantages of LC over OC. However, occasionally anatomical or

physiological considerations will preclude the minimal access approach, and conversion to an open operation in such cases reflects sound judgment and should not be considered a complication

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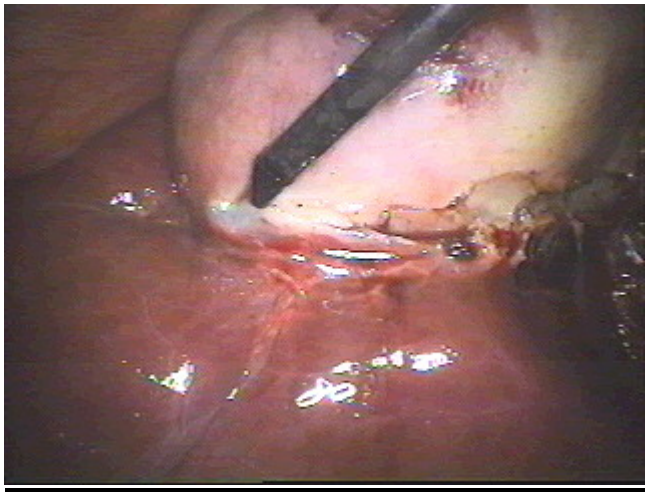
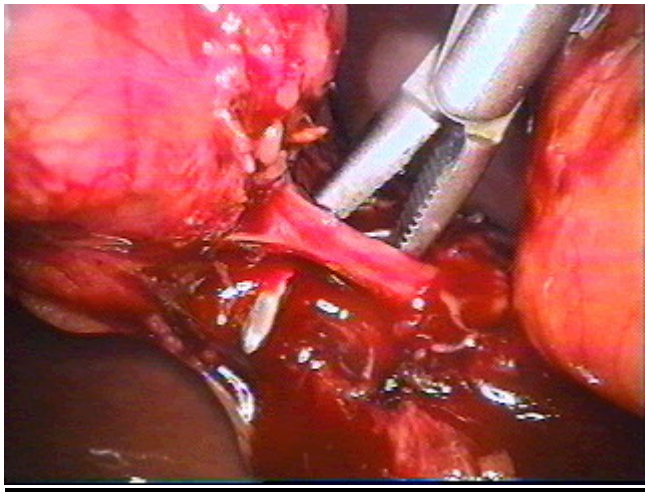
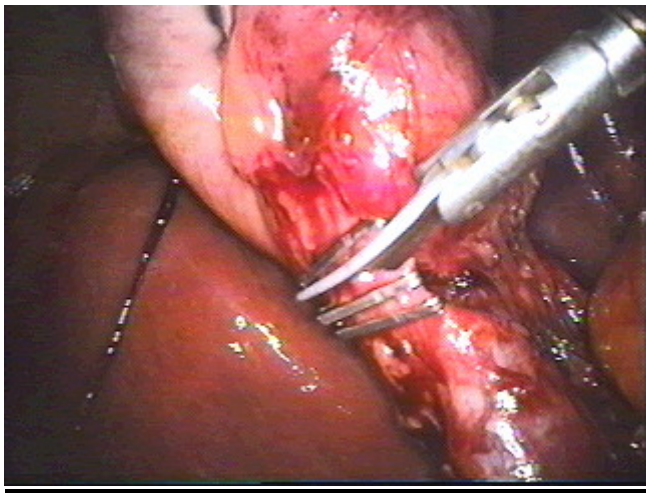
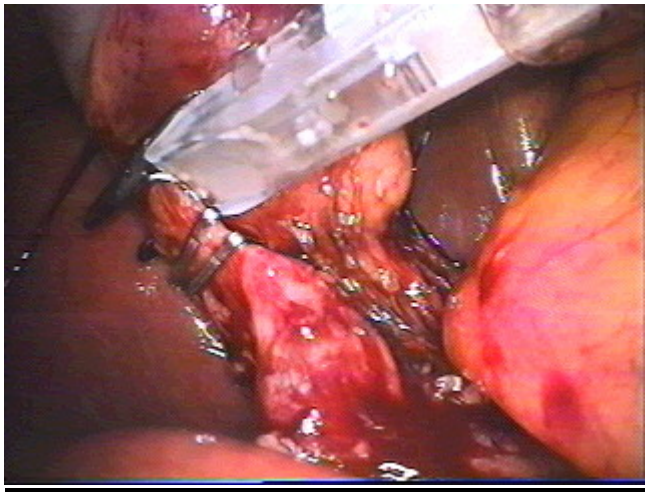
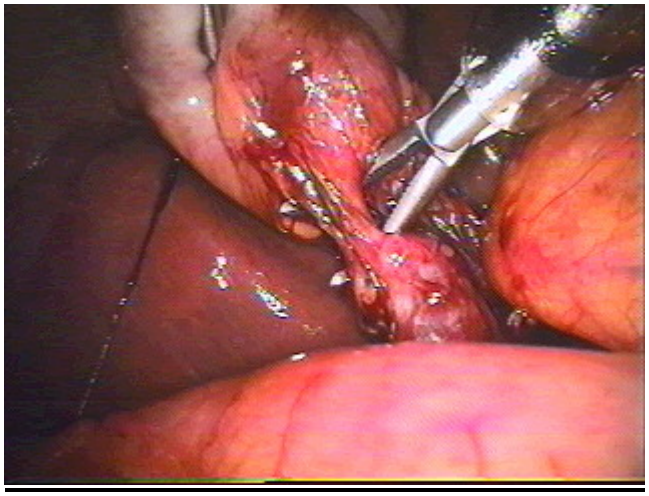
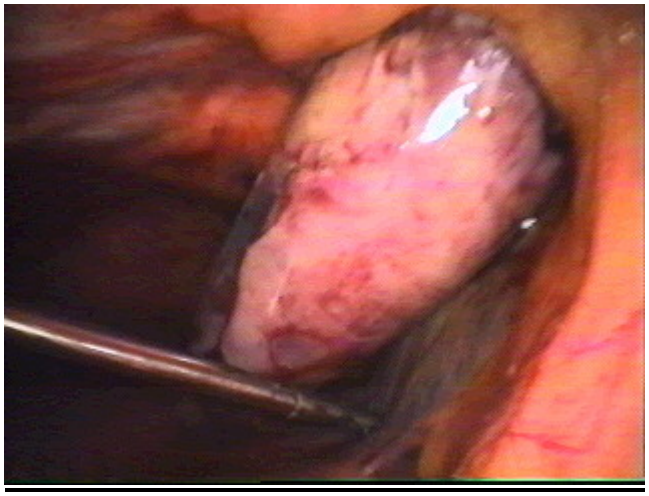




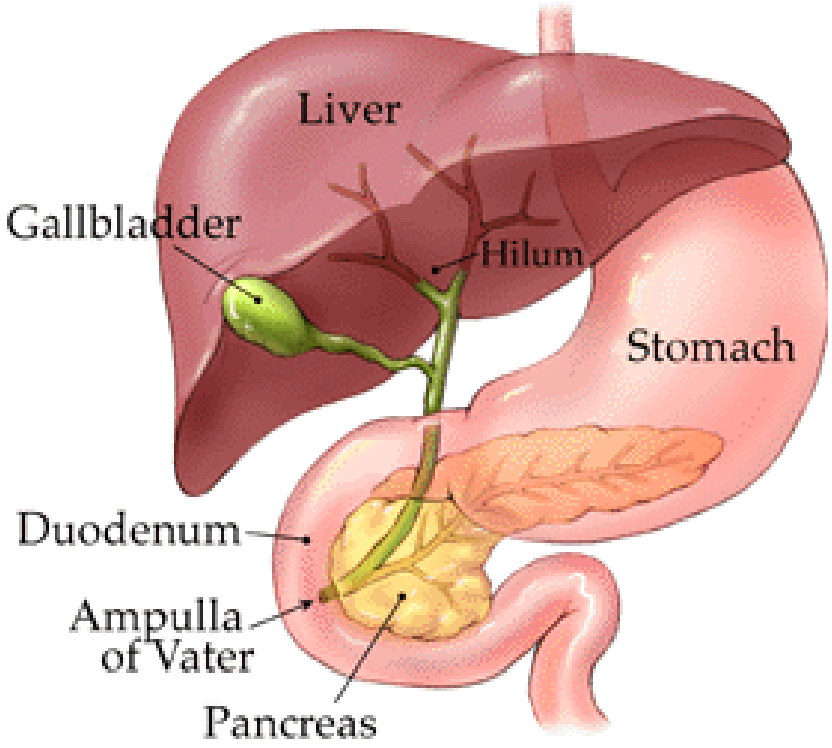


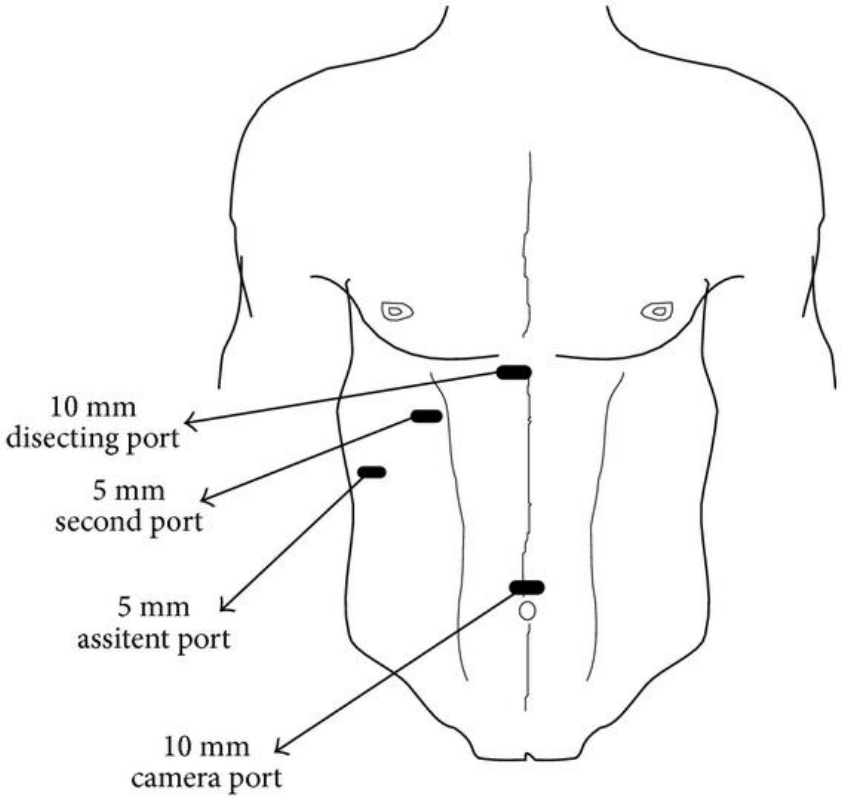


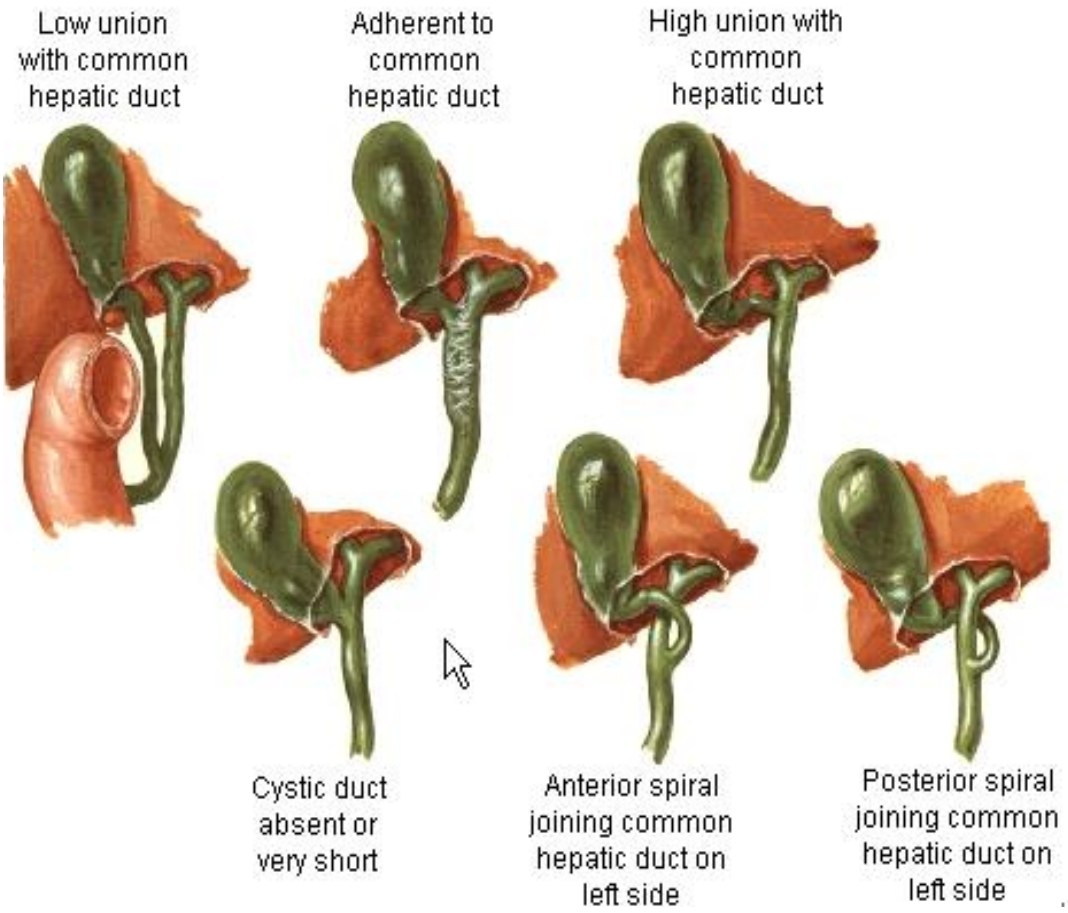




9.	**ANNEXURES** **I) Proforma** **II) Master Chart**




10 mm
disecting port
5 mm
second port
5 mm
assitent port
10 mm
camera port


Low union with common hepatic duct
Adherent to common hepatic duct
High union with common hepatic duct
Cystic duct absent or very short
Anterior spiral joining common hepatic duct on left side
Posterior spiral joining common hepatic duct on left side

ANNEXURE I

PROFORMA

PATIENT'S DETAILS**:**

NAME : IP NO:

AGE/SEX:

DOA: DOD: DOS:

RESIDENCE:

Socio Economic Status:

Chief Complaints:

- Pain right upper quadrant
- Fever
- Vomiting
- Dyspepsia

History of Presenting Illness:

Pain – Duration, nature, radiation, associated features.

Vomiting – Character, Bile stained, Foul smelling.

Past History:

- Similar history in the past,
- H/o jaundice/ Cholangitis
- H/o previous abdominal surgery

Treatment History:

Class of drug and duration of drug intake

PERSONAL HISTORY: Diet- Appetite- Sleep- Bowel and Bladder- Habits-. Alcohol- smoking - DM/HT/BA/IHD

Family History:

History of gall stone disease in the family.

General Physical Examination:

- Pallor
- Icterus
- Cyanosis
- Clubbing
- Lymphadenopathy
- Pedal edema.

VITAL SIGNS:

- Temperature
- Pulse
- Blood Pressure
- Respiratory Rate

PER ABDOMINAL EXAMINATION:

- Inspection
- Palpation

- Percussion
- Auscultation

PER RECTAL EXAMINATION:

OTHER SYSTEMIC EXAMINATION:

- Cardiovascular system
- Respiratory system
- Central Nervous system

PROVISIONAL DIAGNOSIS:

INVESTIGATIONS:

Blood routine: Hb%- TC- DC- ESR-

Urine routine:

- Albumin- sugar- microscopy
- RBS- Blood Urea- Serum Creatinine.
- Abdominal Ultrasound
- Liver Function Tests

Other specific investigations:

- Chest X-Ray, ECG

FINAL DIAGNOSIS:

PRE-OPERATIVE PREPARATION:

- Nil by mouth for 8 hours.
- Informed written consent.

- Inj. TT
- Inj. Cefataxime 1g IV at the induction time.

OPERATIVE MANAGEMENT:

DOO: Anaesthesia:

Procedure: - Laparoscopic/Open:

Incision:

Findings:

Complications: Blood loss, Bile leakage

Stone spillage:

Duration:

Conversion:

Drainage:

Catheterization:

POST OPERATIVE OUTCOME:

Time of return of bowel sounds:

Post op orals:-

Pain score (VAS): -

Grade0: Almost pain free

Grade1: Slight pain

Grade2: Average pain

Grade3: More than average pain

Grade4: Moderate pain

Grade5: Severe pain

Duration of pain:

Duration of NSAID intake:

Condition of patient at discharge:

POST OP COMPLICATION:

Immediate:

- Retention of urine ,Vomiting
- Abdominal distension
- Bleeding
- Jaundice

Delayed:

- Wound infection ,Incisional hernia

FOLLOW UP:

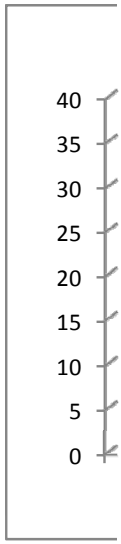
- Suture removal
- Return to normal work.
- Histopathological report

ANNEXURE III

ABBREVIATIONS

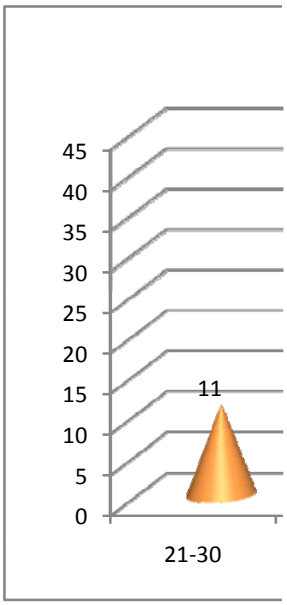
LC	-	Laparoscopic Cholecystectomy
OC	-	Open Cholecystectomy
CBD	-	Common Bile Duct
RHA	-	Right hepatic artery
FVC	-	Forced Vital Capacity
FEV_1	-	Forced Expiratory Volume in 1^{st} second
VAS	-	Visual Analogue Scale
PaO_2	-	Partial Pressure of Oxygen
CVA	-	Cerebro-Vascular Accident
CAD	-	Coronary Artery Disease
IAP	-	Intra Abdominal Pressure
GB	-	Gall Bladder
$ETCO_2$	-	End Tidal Carbon dioxide
DVT	-	Deep Venous Thrombosis
LFT	-	Liver Function Test
USG	-	Ultra Sonography
NSAID	-	Non Steroidal Anti-inflammatory Drug
OPD	-	Out Patient Department

Sex	MALE	FEMALE
LC	11	38
OC	9	23

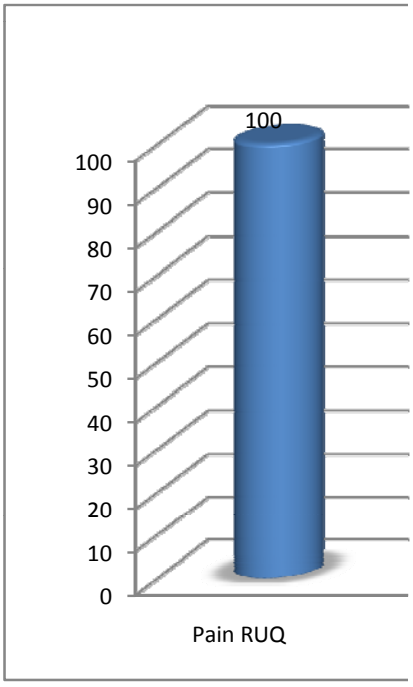


LC	OC
49	32

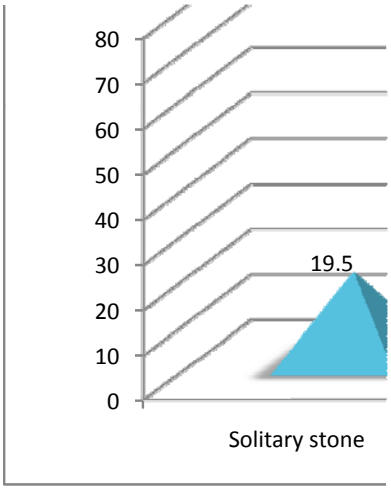
Age	Percentage	
21-30	11	
31-40	24	
41-50	41	
51-60	16	
>60	8	



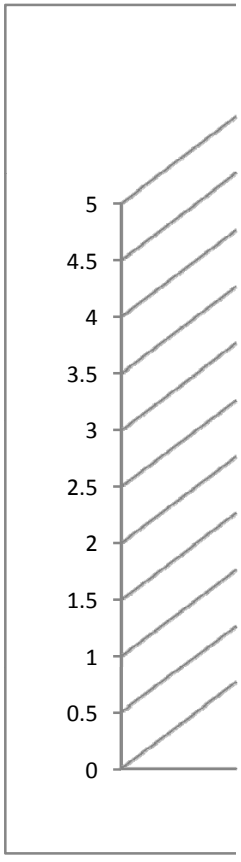
Complaints		percentage
Pain RUQ		100
Vomiting		45
Fever		18.5
Dyspepsia		38
Similar history		10



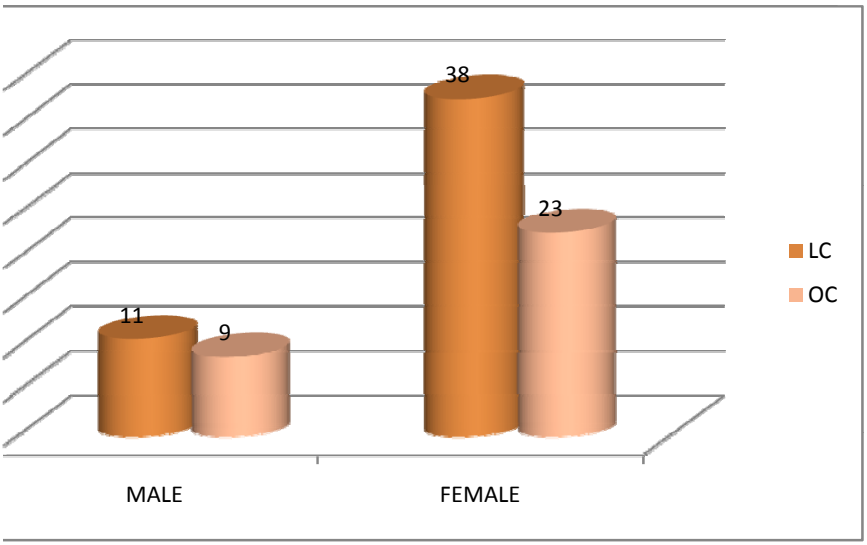
USG Findings		Percentage
Solitary stone		19.5
Multiple stones		72.5
sludge		8

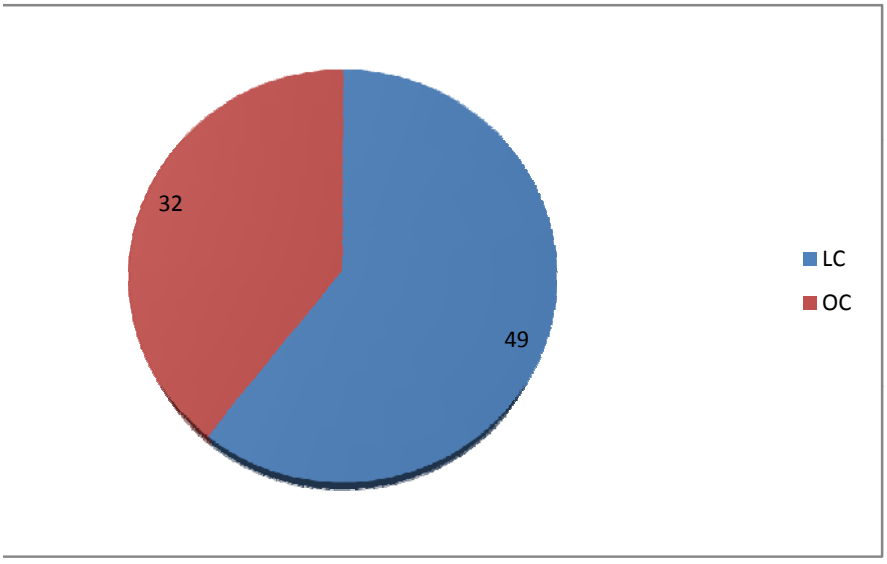


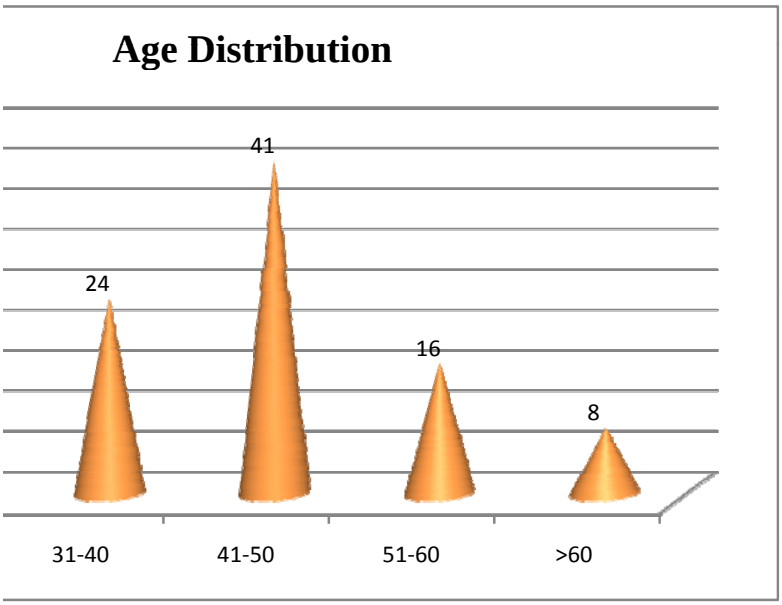
	LC	OC
VAS (Grades 0-5)	2	3
Analgesic used for (days)	3	5

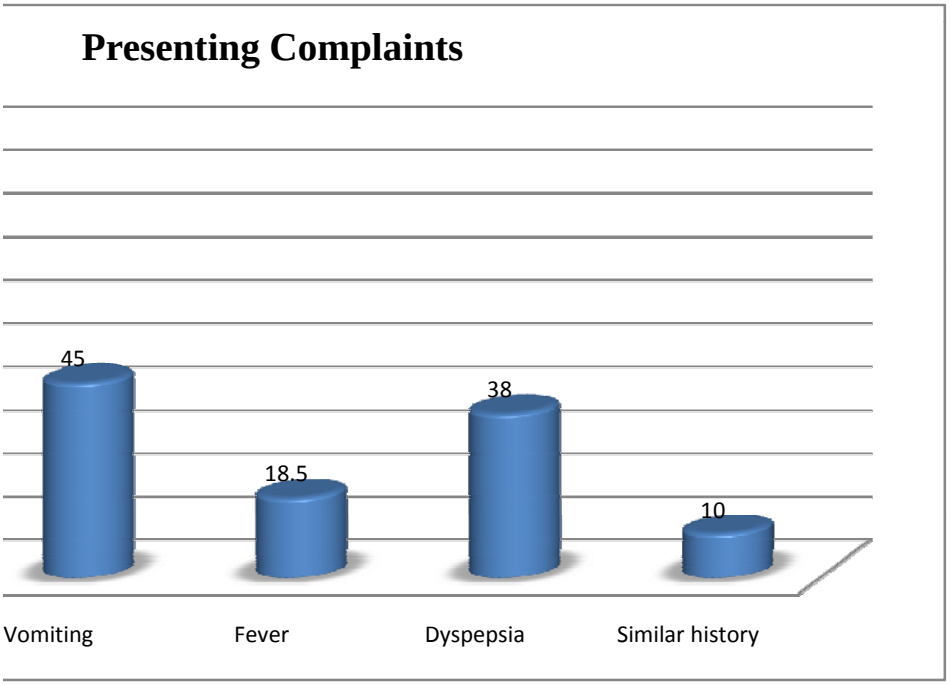


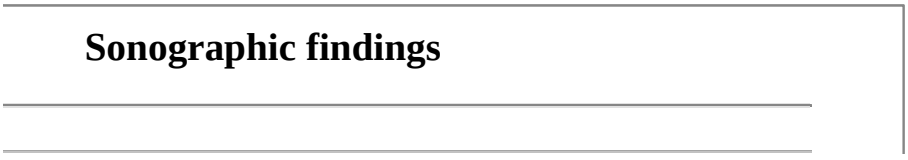
Post operative recovery	**LC**	**OC**
Time to	2	4
Duration of	4	7
Time taken to return to normal work (in weeks)	2	3

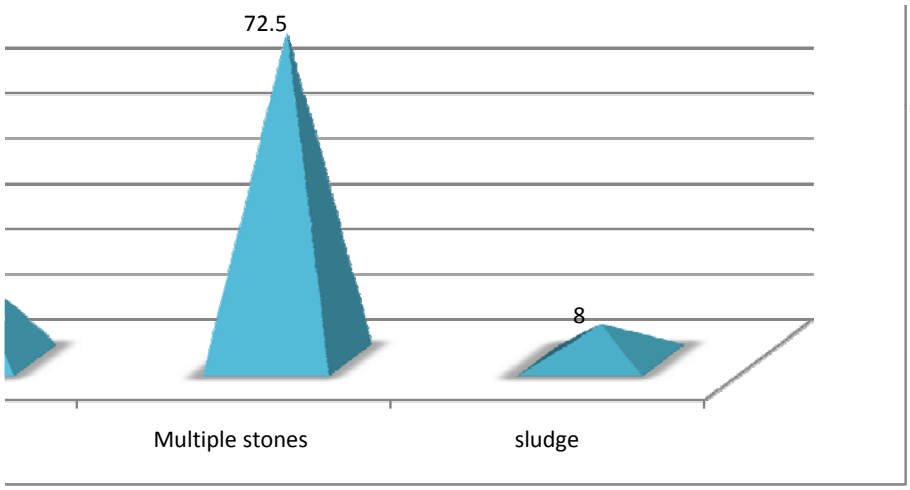

38
23
11
9
LC
OC
MALE
FEMALE

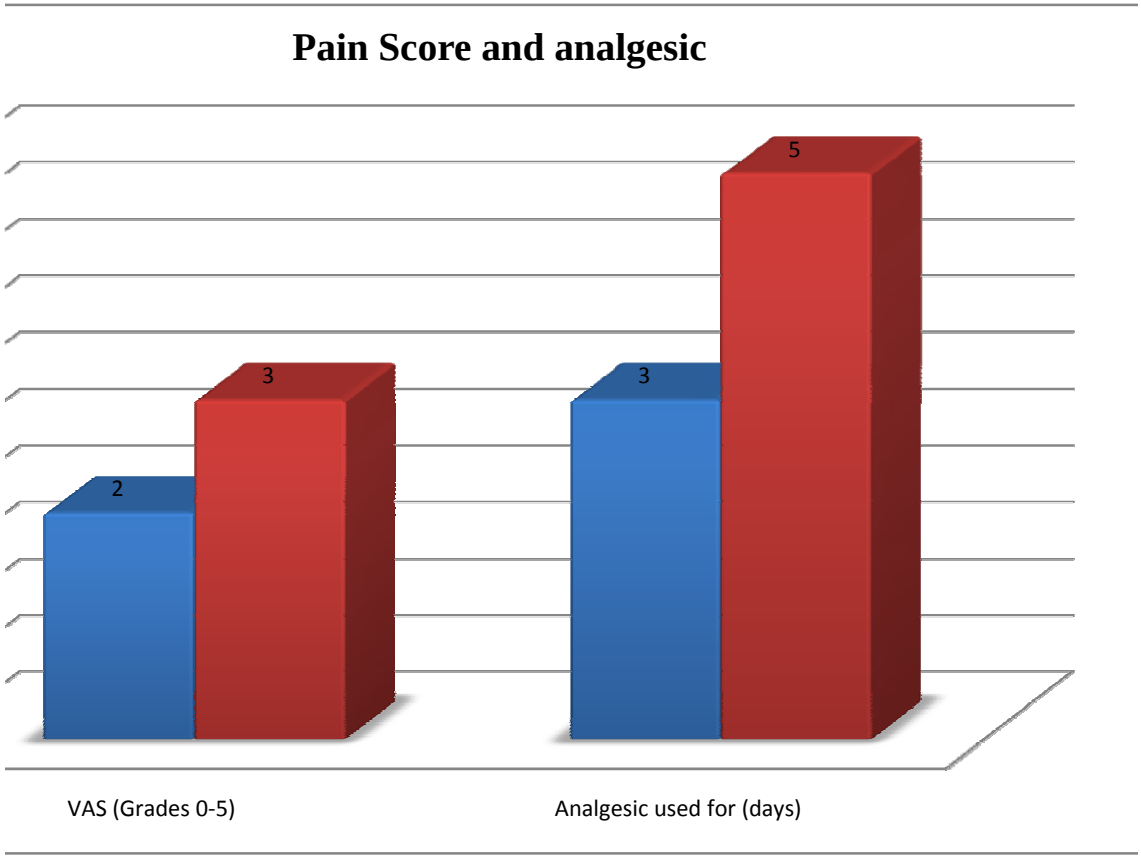

32
49
LC
OC

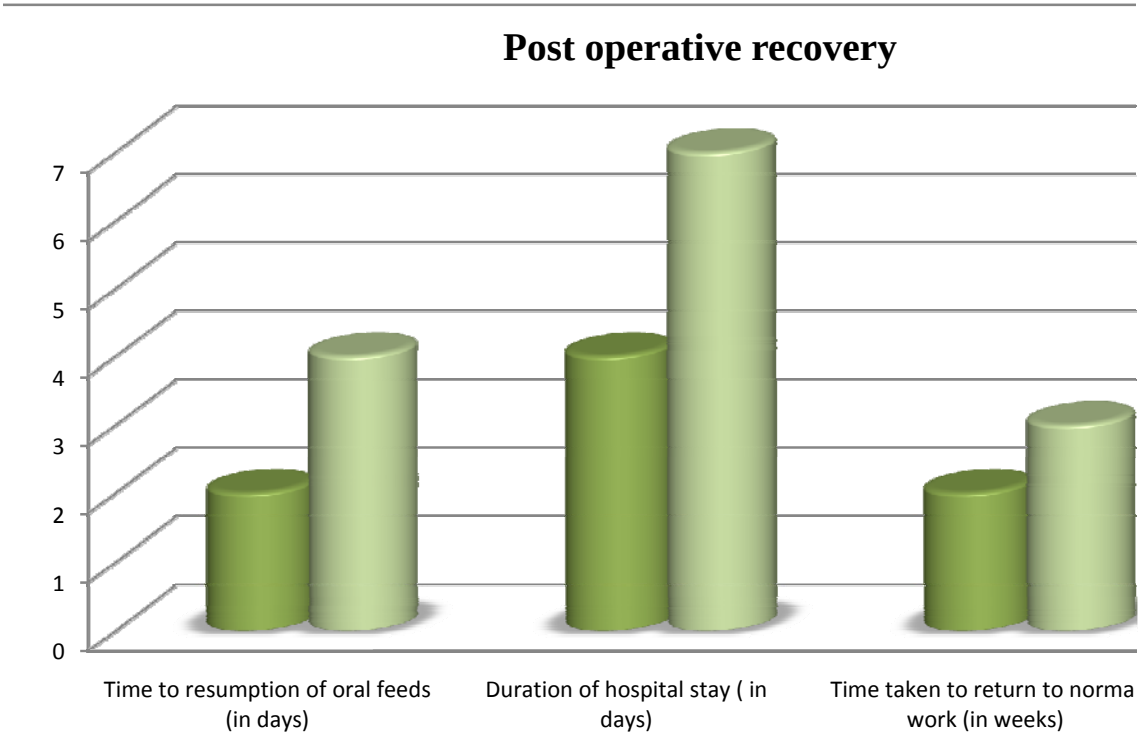

Age Distribution
41
24
16
8
31-40
41-50
51-60
>60


Presenting Complaints
45
18.5
38
10
Vomiting
Fever
Dyspepsia
Similar history

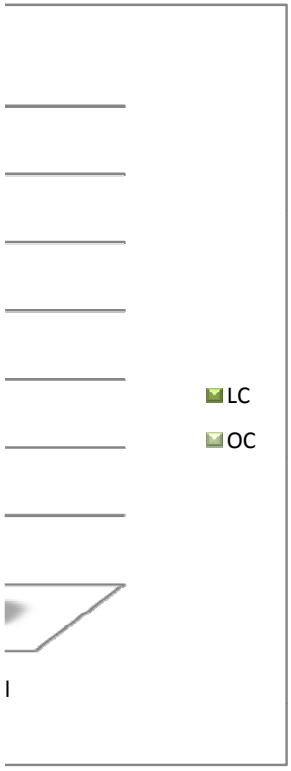

Sonographic findings


72.5
8
Multiple stones
sludge


Pain Score and analgesic
2
3
3
5
VAS (Grades 0-5)
Analgesic used for (days)


Post operative recovery
7
6
5
4
3
2
1
0
Time to resumption of oral feeds (in days)
Duration of hospital stay (in days)
Time taken to return to norma work (in weeks)


LC
OC


LC
OC

S.No	NAME	AGE/SEX	IP NO	SUR	USG FINDINGS	POST OP STAY (DAYS)	COMPLICATIONS	PRO&DUR (Mins)	DRAIN & DUR (DAYS)	ANALGESIC DUR (Days)	RECOVERY (Weeks)
1	ALAGUMUTHU	54M	4974	LC	Multiple stones	4		120	2	2	2
2	MOOKAIAH	50M	10164	OC	2stones, inflamed GB	8		90	4	5	3
3	PETCHIAMMAL	39F	17276	OC	Single stone, Mucocele GB	8		70	4	4	3
4	PITCHIYAMMAL	65F	20309	OC	Biliary sludge	9	Wound infection	75	5	10	4
5	SOLOMON DAVID	48M	37291	OC	Single Stone Thickened GB	12	Transient Bile leak	60	8	5	3
6	SANTHANAM	55F	45974	OC	Single Stone	8		100	4	5	3
7	DURAIPANDI	35M	30766	LC	Multiple stones	5		60	2	2	2
8	PIRAMU	75F	25672	LC	Multiple stones, GB dilated	4		110	2	2	1
9	SATHYA	19F	34440	LC	Multiple stones, Ovarian cyst	5		95	2	3	2
10	RAMASAMY	50M	29866	LC	Multiple stones, Thick GB wall	4		80	3	3	1
11	SAROJA	57F	23952	OC	Biliary sludge	14	Wound dehiscence	70	5	8	4
12	BALARAMAN	54M	26173	LC	Multiple stones	4		160	1	3	2
13	ANNATHAI	60F	28107	OC	Multiple stones	8		70	4	5	3
14	CHOKKALINGAM	75M	31269	LC	Multiple stones, Distended GB	5		130	1	3	2
15	SIVAKAMI	30F	40757	LC	Single stone	5		70	2	3	1
16	REVATHI	49F	41811	LC	Multiple stones	4		110	2	2	2
17	MUTHALAM	45F	31666	LC	Multiple stones	8	Wound infection	75	2	6	3
18	RAMAIAH	33M	35463	LC	Multiple stones	4		100	3	3	2
19	ANTONYAMMAL	46F	33984	LC	Biliary sludge, Distended GB	7	Transient bile leak	80	2	5	2
20	NEELAVASHI	39F	5668	LC	Multiple stones, Distended GB	5		85	2	3	1
21	MOOKAYEE	70F	35903	OC	Biliary sludge	8	Wound infection	100	4	7	5
22	ARUNTHATHI	52F	39819	LC	Multiple stones	5		70	2	3	2
23	SIVANAMMAL	49F	41036	OC	Single stone embedded in theneck of GB	8		65	4	5	3
24	MANGAIYARKARASI	33F	48797	LC	Multiple stones	3		120	2	3	2
25	DEIVANAI	44F	3298	OC	Multiple stones	12	Wound infection	65	4	6	4
26	PRAMU	56F	29939	LC	Multiple stones	4		80	2	3	2
27	MARIAMMAL	23F	32799	LC	Two stones, biliary sludge	4		90	1	2	2
28	CHANDRA	43F	35727	OC	Single stone, Thick GB wall	8		70	5	5	3
29	MALATHI	28F	11527	OC	Multiple small impacted stones	8		110	3	5	3
30	PEERPAH	40F	10500	OC	Multiple stones	7	Incisional hernia	65	2	5	3
31	MASANAMUTHU	62M	58626	OC	Biliary sludge	9	Wound infection	90	4	7	4
32	SARASWATHI	57F	4216	LC	multiple stones	4		85	2	3	3
33	VANI	34F	17134	LC	Multiple stones, Thick wall	4		100	2	3	2
34	SUBBUKUTTY	65F	14513	LC	Multiple stones, Thick GB wall	3		120	1	2	2
35	KALYANI	50F	29310	LC	Single stone, GB wall edema	4		140	2	2	2
36	VELU	65F	16615	LC	Multiple stones, inflamed GB wall	4		95	3	3	1
37	ELANGAVATHI	23F	17590	LC	Single stone	4		65	2	3	2
38	MARIAMMAL	22F	32636	LC	Multiple stones, Inflamed GB wall	4		110	2	4	1
39	ESAKKIAMMAL	47F	39363	OC	Multiple stones	11	Wound infection	80	2	8	5
40	SUBRAMANIAN	64M	16608	OC	Multiple small stones Distended GB	8		90	4	4	3
41	THAJNISHA	45F	44437	LC	Multiple stones, Thick GB wall	7	Transient leak	110	4	5	2

42	CHANDRAKALA	39F	49433	LC	Multiple stones, Thick GB wall	5		95	2	3	2
43	PATHAA	57F	18672	LC	Multiple stones	4		80	2	2	1
44	PONNAMMAL	45M	2371	LC	2stones, inflamed GB	4		120	2	3	2
45	RAJ	44F	18745	OC	Single stone, Mucocele GB	7		60	3	5	3
46	RAMAR	34M	19600	LC	Multiple Stones	4		110	2	3	2
47	KASARA	69F	15410	LC	Single Stone Thickened GB	4		95	2	3	2
48	KANNAN	27M	6632	OC	Single Stone	8		70	4	5	3
49	MYMEEM	55M	21792	OC	Multiple stones	8		75	4	5	3
50	KUTTIYAMMAL	60F	4690	OC	Multiple stones, GB dilated	8		90	4	4	42
51	SANTHA	41F	7535	LC	Multiple stones, Ovarian cyst	4		110	2	3	2
52	BEENA	40F	11829	LC	Multiple stones, Thick GB wall	4		95	2	3	3
53	PARAMASIVAM	31M	16603	OC	Multiple stones	8		65	4	5	2
54	SEETHALAKAHMI	51F	29697	LC	Multiple stones	4		100	2	3	1
55	LATHA	36F	30660	LC	Multiple stones	4		110	1	3	3
56	SELVAM	62M	32642	OC	Multiple stones, Distended GB	11	Wound infection	90	5	6	4
57	SELVI	27F	8005	LC	Multiple stones	4		100	2	3	2
58	MURUGAVALLI	32F	40809	LC	Multiple stones	5		65	2	3	2
59	SOWMIA	53F	50141	OC	Multiple stones	8		60	4	5	3
60	ESAKKIAMMAL	27F	26947	OC	Multiple stones	8		50	4	4	3
61	RAMALAKSHMI	60F	25977	OC	Single stone, Distended GB	8		75	4	5	3
62	SORNAM	55F	28586	LC	Multiple stones, Distended GB	7	Transient leak	80	4	3	2
63	RANGASAMY	58M	27435	OC	Biliary sludge	8		90	4	3	3
64	KATHEEJA	60F	34164	OC	Single stone	8		70	5	5	4
65	ANNATHAI	47F	30585	LC	Single stone embedded in the neck of GB	4		110	2	4	2
66	JAYALAKSHMI	30F	33507	LC	Multiple stones	5		120	2	3	1
67	RANI	34F	47853	LC	Multiple stones	4		90	2	2	2
68	INDRA	34F	49012	OC	Multiple stones	7		65	4	5	3
69	SARASWAHI	50F	50905	OC	Two stones, biliary sludge	9		70	4	5	3
70	ANBUBAKKIAM	39F	11794	OC	Single stone, Thick GB wall	8		70	4	4	4
71	RAJAMMAL	47F	11750	LC	Multiple small impacted stones	4		110	2	3	2
72	SUBBUTHAI	56F	41054	LC	Multiple stones	7	Wound infection	130	2	3	2
73	ESAKKIAMMAL	45F	13949	LC	Multiple stones	4		150	2	2	1
74	SANKARAVEL	80M	15971	LC	Single stone	4		90	2	3	2
75	LAKSHMI	39F	22841	LC	Multiple stones, Thick wall	4		100	2	3	2
76	MURUGAN	35M	5835	LC	Multiple stones, Thick GB wall	4		60	2	3	1
77	FATHIMA	25F	19501	OC	Single stone, GB wall edema	10	Transient leak	80	6	5	4
78	RAJAMMAL	52F	15112	LC	Multiple stones, inflamed GB wall	5		90	2	3	2
79	PARVATHI	36F	23880	LC	Single stone	4		95	2	2	2
80	MUTHAMMAL	30F	24370	OC	Multiple stones, Inflamed GB wall	8		65	4	5	3
81	SUDAR	23M	34950	LC	Multiple stones	4		110	2	2	2